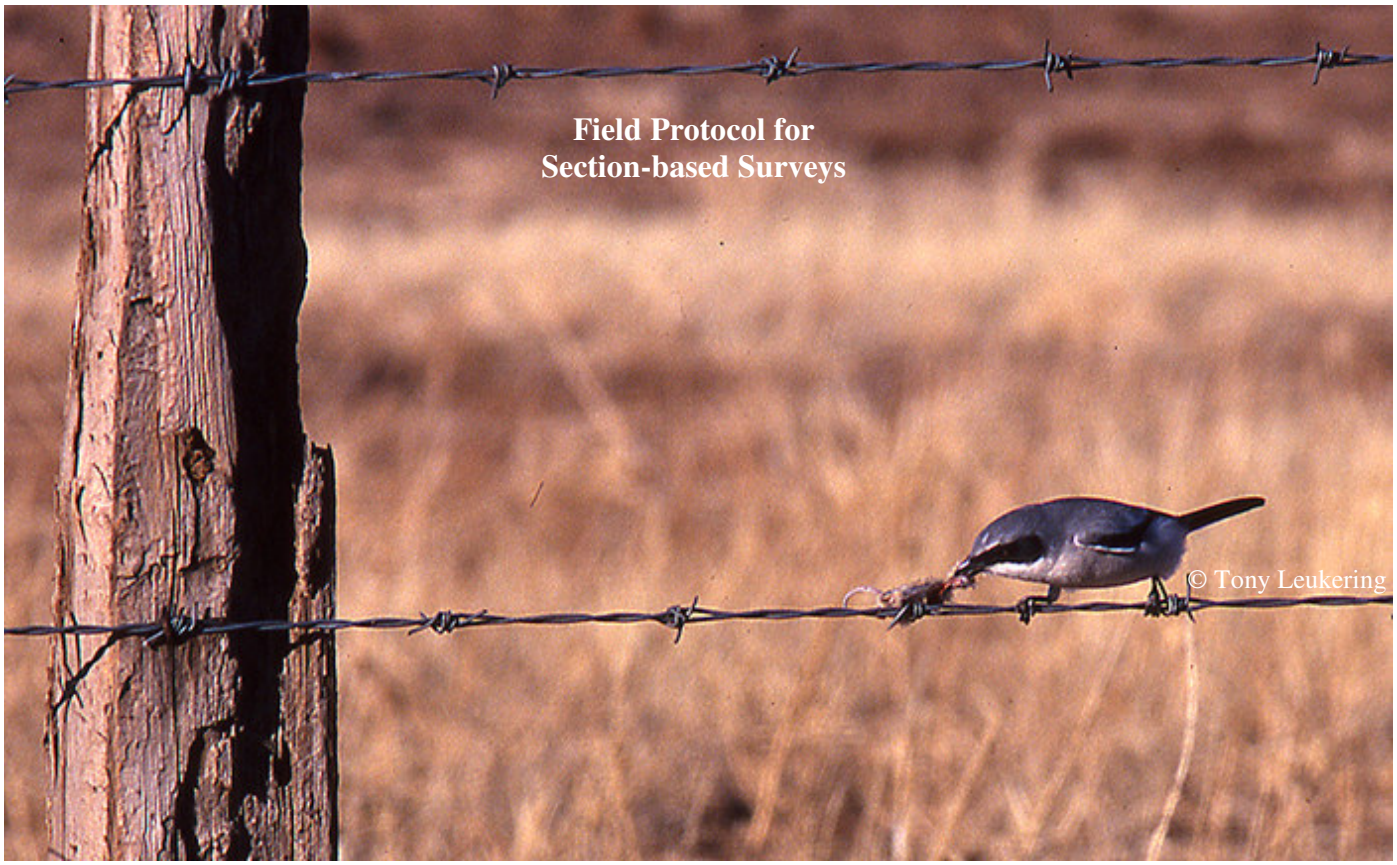

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Executive Summary

In 2004, Rocky Mountain Bird Observatory (RMBO) implemented the fourth year of grassland bird-monitoring program within the shortgrass prairie region. During this year, RMBO conducted surveys in four western states (Nebraska, Colorado, Kansas, and Oklahoma) and five National Grasslands (Cimarron, Comanche, Kiowa, Pawnee and Rita Blanca). The objective of this program is to monitor population trends and distributions of grassland birds within the Shortgrass Prairie Bird Conservation Region (BCR 18) using section-based surveys, a road-based point count technique. A section ($1mi^2$) is the basic land management unit of the prairie. The section-based survey technique was determined to be the most efficient and effective method for surveying and monitoring grassland birds (Hanni 2002) in a landscape dominated by private ownership.

RMBO surveyed 2,414 sections within BCR 18, 15 May – 3 July 2004. Sections were stratified by habitat then randomly selected for survey in proportion to habitat acreage on the landscape – 1,802 sections of native prairie habitat, 552 of dry-land agriculture habitat, and 60 of land in CRP. We observed 115 bird species. Included are 38 species of concern, as recognized by Partners In Flight (2004) and/or the participating state and federal agencies. We calculated density estimates for 49 species, analyzed by management unit, habitat type, percent shrub cover and grass height. Included among these monitored species are 22 species of concern, as recognized by Partners In Flight (PIF database 2004) and/or the participating state and federal agencies. We present distribution and index of abundance maps for 62 species.

Long-term Monitoring of Short Grass Prairie BCR region will provide valuable information on trends and distribution within a framework that allows land managers to make cooperative management decisions. Equipped with this information and habitat preferences of prairie birds, land managers will be able to target specific habitat conditions within and across management units to assess habitat suitability for species of concern. In addition, monitoring birds will provide data that can by applied to monitoring ecosystems. This is possible since bird species utilize an inclusive habitat spectrum within ecosystems. As a result bird monitoring provides cost-effective means for monitoring ecosystems at a variety of scales.

Introduction

The Shortgrass Prairie BCR is a unique ecosystem stretching from southern South Dakota, south through western Nebraska, eastern Wyoming, eastern Colorado, western Kansas, eastern New Mexico, Oklahoma's panhandle and western Texas, of which, approximately 52% (280,800 km^2) of historic short grass prairie remains (Samson et al. 2004). The Short Grass Prairie is dominated by Blue Grama (Bouteloua gracilis) and Buffalo Grass (Buchloe dactyloides) within most of the region (Stoddart et al. 1975). Historically the Short Grass Prairie is characterized by dramatic variations in precipitation, fire and grazing mammals (Knopf 1988). Research in this region has defined the need for comprehensive conservation plans, to maintain its ecological integrity.

Grassland birds have experienced steeper, more consistent, and geographically more widespread declines than any other guild of North American avian species (Sampson and Knopf 1996). Several species found in this ecosystem are endemic (found nowhere else) or are closely associated with the Great Plains grasslands (Mengel 1970) such as Baird's Sparrow, Cassin's Sparrow, Chestnut-collared Longspur, Ferruginous Hawk, Lark Bunting, Long-billed Curlew, McCown's Longspur and Mountain Plover.

Some managers have relied on data derived from the Breeding Bird Survey (BBS), currently the most extensive bird-monitoring program in the U.S., to monitor bird populations (Robbins et al. 1989, Sauer 1993). The BBS, operational in the Great Plains since 1967, uses volunteers to conduct roadside surveys of birds across North America and produces indices of population abundance at the continental scale for many common bird species (Robbins et al. 1989). BBS data and analyses are relatively inexpensive and have proven to be a valuable source of information on bird population trends. BBS data can produce continental-scale relative abundance maps. These maps provide a reasonably good indication of the relative abundances of species well sampled by the BBS. However, many species and habitats are inadequately sampled by the BBS (Robbins et al. 1993, Sauer 1993), and BBS data do not reliably predict population trends at small geographic scales such as a National Grassland, states, or even larger eco-regions (i.e., BCRs) (Sauer 2000). According to the Partners In Flight, 85% of upland species breeding in the Shortgrass Prairie Bird Conservation Region (BCR 18) lack sufficient data to address current population trends (PIF database 2004). For these and other reasons, BBS data are generally insufficient to guide local and regional management decisions.

In response to this need, RMBO, in cooperation with the Colorado Division of Wildlife (CDOW), assessed field techniques in 2001 to determine which was most efficient for monitoring shortgrass prairie birds. We evaluated four techniques that were randomly allocated across the shortgrass prairie of Colorado: 1) section-based point counts, conducted at the section level from roads (n = 1,237 sections); 2) interior line transects, conducted at the section level away from roads (n = 48 sections); 3) Monitoring Colorado's Birds (MCB) point transects, conducted irrespective of sections and roads (n = 22 point transects); and 4) 30-mile driving line transects, conducted along roads,

through all habitat types in Colorado (n = 87 line transects). We used program DISTANCE to estimate bird densities using each of the four techniques. The results suggested that the section-based point count technique was the most efficient in monitoring birds in the shortgrass prairie (Hanni 2002). Hereafter, we refer to this technique as section-based surveys.

RMBO designed the section-based survey technique based on the common unit of land management in the prairie, the 1 mi^2 section, hence the name 'section-based survey.' Section-based surveys provide data used to: 1) monitor bird population trends and changes in distributions of individual species; 2) relate vegetation characteristics and management practices to bird communities; and 3) determine geographic areas in which to focus conservation efforts.

What makes section-based surveys unique from other bird monitoring techniques is its efficiency and effectiveness in data collection. Efficiency is achieved by conducting the fewest number of surveys per section needed to maximize the number of species detected (Hanni 2002). The efficiency, in turn, increases observer coverage of the study area and increases statistical power of analysis, while maintaining the lowest possible cost. Effectiveness is achieved in its ability to potentially detect population trends for 46 upland breeding species in BCR 18 within 5 - 24 years (CV = 3%, 41%, respectively). Included among these monitored species are 38 species of concern, as recognized by Partners In Flight (2004) and/or the participating state and federal agencies. Other possible advantages of RMBO's grassland bird monitoring program include: 1) stratification by habitat type; 2) sections are surveyed irrespective of landownership; and 3) data can be analyzed at a variety of scales such as county, state, National Grassland, or BCR.

Study Area

We conducted section-based surveys within the BCR 18 portions of Colorado, Kansas, Nebraska, and Oklahoma and on Cimarron, Comanche, Kiowa, Pawnee and Rita Blanca National Grasslands (Fig. 1). This arid region receives 300 - 500 mm of precipitation per year (Lauenroth 1992). Habitats surveyed include native shortgrass prairie, dry-land agriculture, and land in the Conservation Reserve Program (CRP). Native shortgrass prairie habitat is characterized by two dominant grass species, buffalo grass (*Buchloe dactyloides*) and blue grama (*Bouteloua gracilis*). Dry-land agriculture habitat includes non-irrigated field crops such as wheat, hay, and sorghum, or fallow fields. Land in CRP was once in agricultural production, but now planted with cover, native or non-native, to improve water quality and wildlife habitat, and control soil erosion.

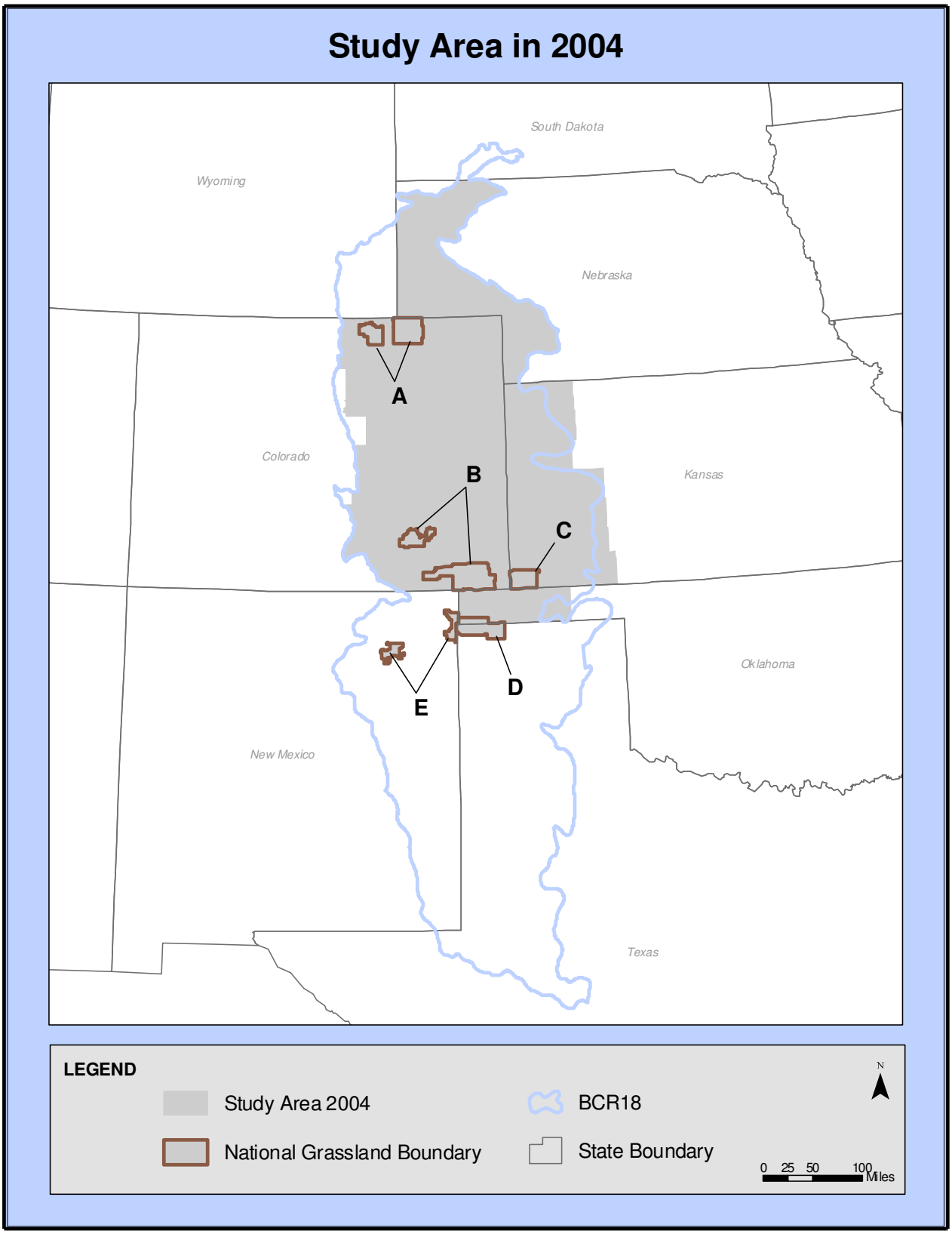


Figure 1. Study Area.

Methods

You will be collecting data on shortgrass prairie birds and their habitat using a technique called *section-based surveys*. The section-based survey technique was designed using the basic land management unit of the prairie, the 1mi^2 section, hence the name 'section-based survey.'

What is a section?

- A section is a 1mi^2 piece of land as delineated by the Public Land Survey System (**PLSS**).
    - Sections appear on road atlases as a grid of squares (Figure 2A).
- The PLSS uniquely identifies every 1mi^2 section using Township, Range, and Section (**TRS)** (Figure 2C).
    - Sections are arranged in groups of 36, a 36mi^2 block of land (Figure 2D). Sections are labeled in a snake-like pattern beginning with section "1" in the top-right corner and ending with section "36" in the bottom right corner of the block. Every section in a block has the same T and R.
    - **Township** designates North/South
    - **Range** designates West/East
    - **Section** identifies each 1 mi^2 with a 36mi^2 block
- Example: "**T**06N**R**55W**S**01" identifies the top-right section in Figure 3 and reads as "township six north, range fifty-five west, section one." You will record the TRS of each section you survey.

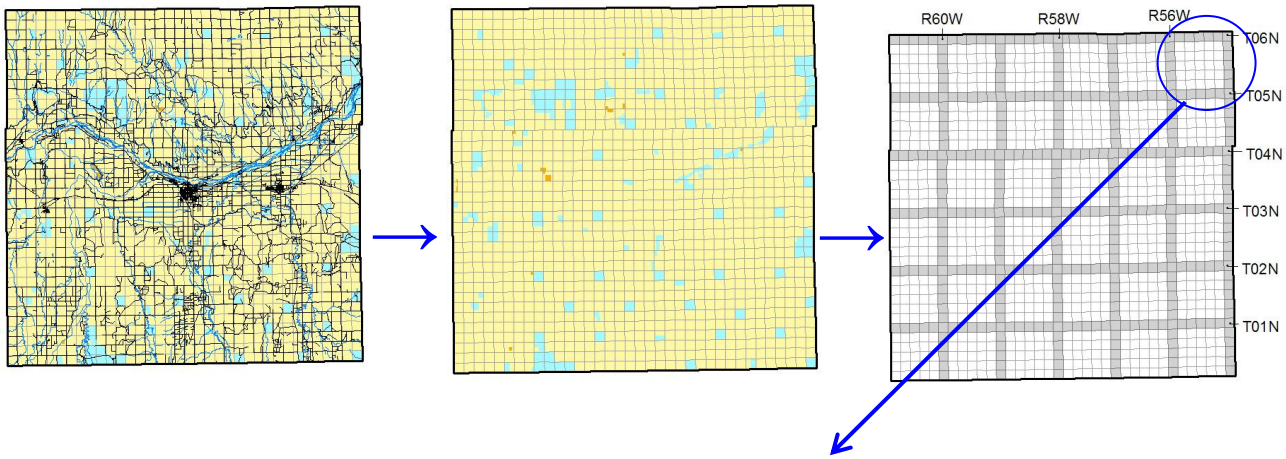
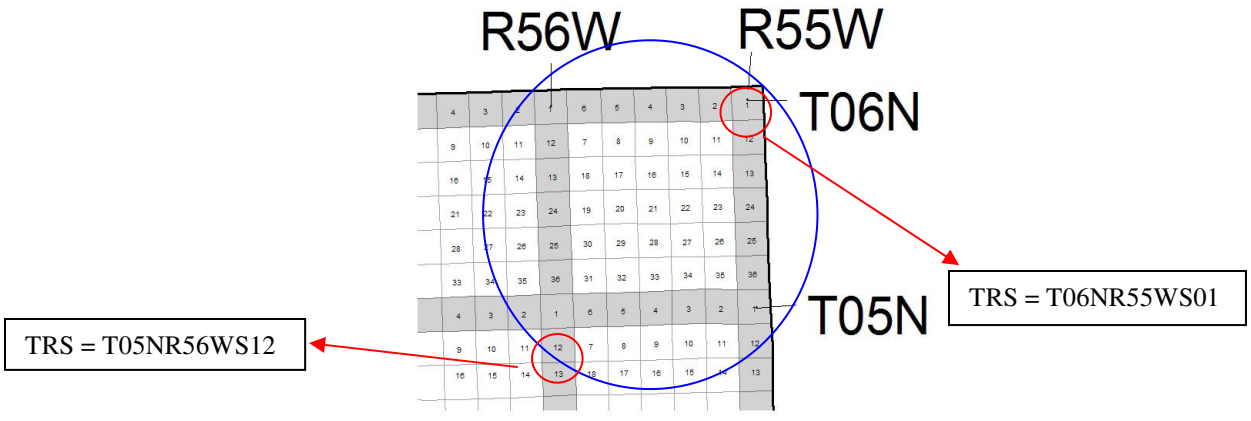


Figure 2. Map of Morgan County, Colorado: (A) as seen in a road atlas, (B) showing only landownership and PLSS grid, (C) overview of PLSS grid coordinates, and (D) detailing a 36mi2 PLSS grid block .



Which sections do I survey?
You will survey the *same sections* as were surveyed in 2004 (Figure 3). We will provide you with a map of the sections you will survey. You will use a road atlas and a GPS unit to locate each section.

In 2004, we surveyed 2,414 sections – 1,802 of native prairie habitat, 552 of dry-land agriculture habitat, and 60 of land in CRP. All surveyed sections were initially *homogenous* habitat: native prairie habitat, dry-land agriculture, or land in CRP. *Temporal changes on sections have occurred, such as conversion of native to irrigated land, especially in Kansas. If you do encounter a heterogeneous or irrigated section continue your survey.* This way we can document trends associated with these temporal changes of land.

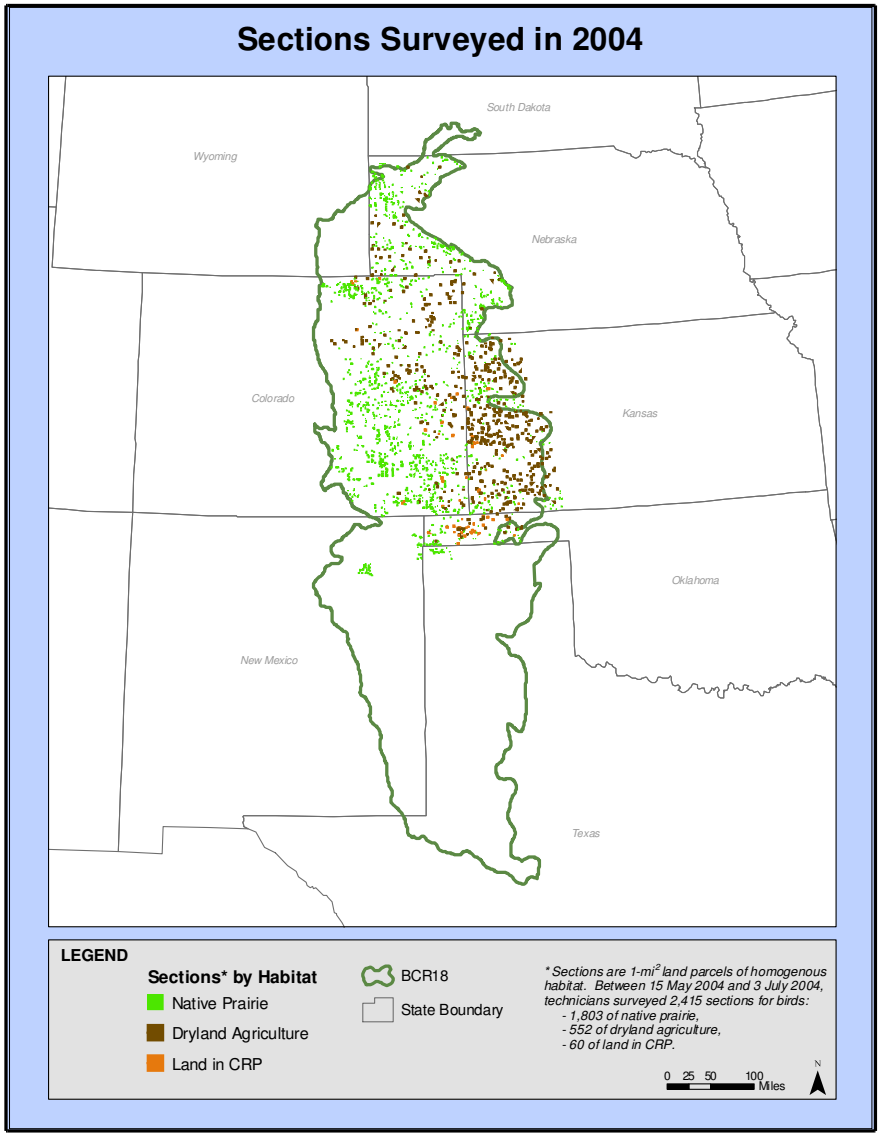


Figure 3. Sections surveyed by habitat type.

How do I survey a section?
You will conduct *three* road-based point counts at *each* section in the *same locations* as in 2004. We will provide you with a map of locations where you will conduct point counts. You will use a road atlas and a GPS unit to find each point count location.

Placement of point count stations among and along adjacent roads is dependent on the number of adjacent roads (Figure 4). For example, at sections adjacent to only one road, three point counts were conducted from that road. On sections bordered by two roads, two point counts were conducted along one road, and one point count was conducted along the other; the road on which two counts were conducted was randomly selected using a random number table. On sections bordered by three roads, one point count was conducted along each road. Where four roads surrounded the section, one road was randomly selected and eliminated using a random number table, and the section was then treated as a three-road section. Point count locations along each road were determined using a random number table and were recorded using a Garmin *etrex* global positioning system (GPS) unit. All point count locations were at least 0.2 mi apart and 0.1 mi from the section corners.

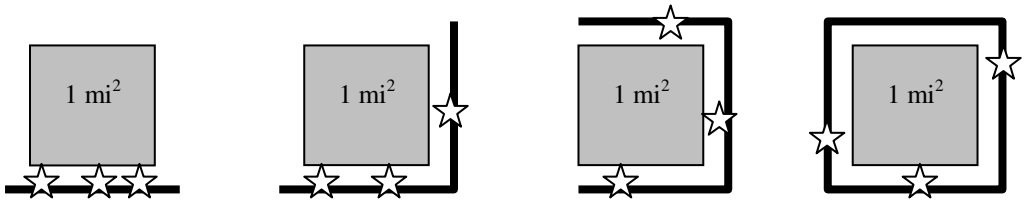


Figure 4. Examples of point count locations (stars) at a surveyed section (1-mi^2). The number of point count locations on each road (black lines) was based on the number of roads adjacent to the section. Locations of point counts along each road were determined using a random number table, spaced at least 0.2 mi apart and 0.1 mi from the section corners.

Point counts will be conducted beginning at **sunrise** and completed by **11:00am** from **May 14 – July 3**, 2005. All field workers will be trained to measure distances to birds, using a Bushnell Yardage Pro 500, and record information on standardized field forms.

Before commencement of each point count, you will record: time, weather, vegetative characteristics, and UTM coordinates of each point count location. You will also record the presence of prairie dog towns, playas, raptor nests, streams, bridges, homesteads, corrals, stock tanks, etc…

You will conduct *three* road-based point counts at each section. Point counts are conducted from the road looking 180° into the section, using the centerline of the road as your boundary. You will conduct each point count for *five minutes*. For each bird you see and/or hear during those five minutes, you will record:

- Species
- Sex (if possible)
- Distance from you to the first point of detection (using a range finder)

- Associated habitat.
- Cluster ID. This is represented by a letter.
- Cluster Size
- Snap Shot

Below is a more detailed account of the data you will be collecting:

Bird Data:

We treat all dependent detections of individual birds as part of a 'cluster' together with the first independently observed bird, rather than as separate independent observations of those individuals. This means that if the detection of an individual bird is dependent upon the previous detection of another individual, the resulting observation is recorded as one independent detection with a cluster size of C, where C is the original individual detected plus the sum of any additional individuals detected as a result of the first individual revealing its presence. For example, a bird sings, and is thus detected independently, as a result, the observer detects a second individual. The resulting observation is recorded as a single detection with a cluster size of two birds. This practice ensures that we adhere more strictly to the assumption inherent in random sampling that all observations are independent of each other.

Species:

- Record the four-letter AOU species codes (e.g., American Robin is recorded as "AMRO").
- If you are unsure of the species, try to narrow it down to Family (e.g., and unknown sparrow is recorded as "UNSP").
- If you are unsure of the species, record the bird as unknown and try to identify the individual after the point count is complete using a field guide. DON'T waste valuable minutes trying to identify a bird during a point count. Identification during a point count should take no more than a 10 or15 seconds.

Sex:

- Sex can be determined for species that show sexual dimorphism; however, in the field this task can by difficult depending on the degree of differences between the sexes.
- Remember that we DO NOT RECORD JUVENILLES so do not mistake juveniles for females.

Distance to point of first detection:

- Determine the distance between you and the point of first detection for each bird using a laser rangefinder. Point of first detection is the location where you first noticed the bird.
- Record distance in *meters* (make sure your range finder is set to the correct units).

Associated habitat:

- Record the habitat immediately associated with each bird such as ground, yucca, cholla, tree, fence, fence post, utility wire, stock tank, playa, homestead, etc.

Cluster ID:

- Cluster ID is represented by a letter. For example, I detect two LARB that were in the same cluster which would indicate one of them was detected as a result of the other, then they would both have the same cluster ID. If you detect one LARB and then another independently then they would have two distinct Cluster IDs. Each individual bird should be recorded on a separate row with an associated cluster ID unless the cluster size is > 5.

Cluster Size:

- Record the size of the cluster. Since we are considering all detections clusters each individual detection will have a cluster size of *1 or a number >5.*

Snap Shot:

- Snap Shot: Two minutes into the point count take a moment in time (2 seconds), record and check all species observed during that snap shot in time.

Vegetation Data Collection:

We devised a strategy to collect objective vegetative information. Collected information includes grass height, percent cover for shrubs, and shrub type and is outlined in detail below. The data will be collected from the point count stations so the surveyed area will include vegetation located within a semi-circle with a 150-meter radius looking into the surveyed section. All technicians will be trained to estimate cover that has been previously measured. The technicians will also be provided with a reference guide that illustrates examples of each of the categories.

Grass Height and Percent:
Data for grass height will be collected and separated into two categories, <15 cm and >15 cm (~ankle height). If there is a combination of the two heights the proportions of each category will be recorded.

Shrub Percent:
Data will be collected on the percent cover of the shrub and which shrub community is present. Technicians will be provided with a reference guide to shrub percent that will give examples of shrub percent for each of the different shrubs to be encountered in the field. The categories for the percent shrub will be <1%, >1%-3%, >3%-10%, and >10%. These percentages will be recorded for sandsage, rabbit brush, four winged salt bush, greasewood, cholla, and yucca.

Additional Data Collection:

Additional data will be collected on trees, perches, water, nests, topography and prairie-dog colonies and playas at each point count location. *You will record their locations by drawing these structures onto a map of the section you are surveying.*

Trees:
Record the locations of lone and groups of trees located at each point count station.

- Lone Tree (LT): A single tree located.
- Aggregated Trees (AT): A group of trees.
    - Record location and number of the trees in the group.

Perches:

- Record information on available perches (poles, fence, etc.)

Water:

- Record location and size of water.

Nests:

- Record all nests and the substrate type.

Topography:

- Briefly describe the topography (flat, rolling hills, etc.)

Black-tailed Prairie Dog Colonies:

- Record location and estimate acreage of colonies.

Playas:

- Record the locations and size of all playas.

All individuals representing Rocky Mountain Bird Observatory will be sensitive to private property rights and show courtesy and respect to the private landowners.